# MJW21193 (PNP)
# MJW21194 (NPN)

**Preferred Devices**

# Silicon Power Transistors

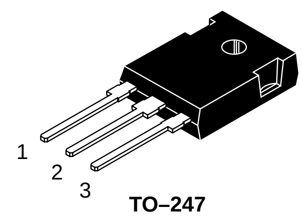
The MJW21193 and MJW21194 utilize Perforated Emitter technology and are specifically designed for high power audio output, disk head positioners and linear applications.

- Total Harmonic Distortion Characterized
- High DC Current Gain –
  $h_{FE}$ = 20 Min @ $I_C$ = 8 Adc
- Excellent Gain Linearity
- High SOA: 2.25 A, 80 V, 1 Second

**ON Semiconductor™**

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**16 AMPERES**
**COMPLEMENTARY**
**SILICON POWER**
**TRANSISTORS**
**250 VOLTS**
**200 WATTS**




**TO–247**
**CASE 340K**
**STYLE 3**

### MAXIMUM RATINGS

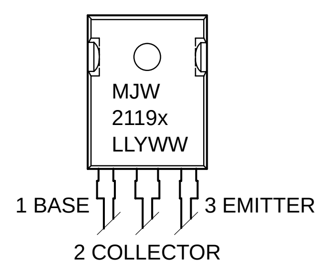
| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Collector–Emitter Voltage | $V_{CEO}$ | 250 | Vdc |
| Collector–Base Voltage | $V_{CBO}$ | 400 | Vdc |
| Emitter–Base Voltage | $V_{EBO}$ | 5.0 | Vdc |
| Collector–Emitter Voltage – 1.5 V | $V_{CEX}$ | 400 | Vdc |
| Collector Current – Continuous<br>– Peak (Note 1) | $I_C$ | 16<br>30 | Adc |
| Base Current – Continuous | $I_B$ | 5.0 | Adc |
| Total Power Dissipation @ $T_C$ = 25°C<br>Derate Above 25°C | $P_D$ | 200<br>1.43 | Watts<br>W/°C |
| Operating and Storage Junction Temperature Range | $T_J$, $T_{stg}$ | –65 to +150 | °C |

### THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| Thermal Resistance, Junction to Case | $R_{\theta JC}$ | 0.7 | °C/W |
| Thermal Resistance, Junction to Ambient | $R_{\theta JA}$ | 40 | °C/W |

1. Pulse Test: Pulse Width = 5 μs, Duty Cycle ≤ 10%.

### MARKING DIAGRAM




MJW2119x = Device Code
x = 3 or 4
LL = Location Code
Y = Year
WW = Work Week

### ORDERING INFORMATION

| Device | Package | Shipping |
|---|---|---|
| MJW21193 | TO–247 | 30 Units/Rail |
| MJW21194 | TO–247 | 30 Units/Rail |

**Preferred** devices are recommended choices for future use and best overall value.

**ELECTRICAL CHARACTERISTICS** ($T_C$ = 25°C unless otherwise noted)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | |
| Collector–Emitter Sustaining Voltage ($I_C$ = 100 mAdc, $I_B$ = 0) | $V_{CEO(sus)}$ | 250 | – | – | Vdc |
| Collector Cutoff Current ($V_{CE}$ = 200 Vdc, $I_B$ = 0) | $I_{CEO}$ | – | – | 100 | μAdc |
| Emitter Cutoff Current ($V_{CE}$ = 5 Vdc, $I_C$ = 0) | $I_{EBO}$ | – | – | 100 | μAdc |
| Collector Cutoff Current ($V_{CE}$ = 250 Vdc, $V_{BE(off)}$ = 1.5 Vdc) | $I_{CEX}$ | – | – | 100 | μAdc |
| **SECOND BREAKDOWN** | | | | | |
| Second Breakdown Collector Current with Base Forward Biased | $I_{S/b}$ | | | | Adc |
| ($V_{CE}$ = 50 Vdc, t = 1 s (non–repetitive) | | 4.0 | – | – | |
| ($V_{CE}$ = 80 Vdc, t = 1 s (non–repetitive) | | 2.25 | – | – | |
| **ON CHARACTERISTICS** | | | | | |
| DC Current Gain | $h_{FE}$ | | | | |
| ($I_C$ = 8 Adc, $V_{CE}$ = 5 Vdc) | | 20 | – | 60 | |
| ($I_C$ = 16 Adc, $I_B$ = 5 Adc) | | 8 | – | – | |
| Base–Emitter On Voltage ($I_C$ = 8 Adc, $V_{CE}$ = 5 Vdc) | $V_{BE(on)}$ | – | – | 2.2 | Vdc |
| Collector–Emitter Saturation Voltage | $V_{CE(sat)}$ | | | | Vdc |
| ($I_C$ = 8 Adc, $I_B$ = 0.8 Adc) | | – | – | 1.4 | |
| ($I_C$ = 16 Adc, $I_B$ = 3.2 Adc) | | – | – | 4 | |
| **DYNAMIC CHARACTERISTICS** | | | | | |
| Total Harmonic Distortion at the Output | $T_{HD}$ | | | | % |
| $V_{RMS}$ = 28.3 V, f = 1 kHz, $P_{LOAD}$ = 100 $W_{RMS}$ — $h_{FE}$ unmatched | | – | 0.8 | – | |
| (Matched pair $h_{FE}$ = 50 @ 5 A/5 V) — $h_{FE}$ matched | | – | 0.08 | – | |
| Current Gain Bandwidth Product ($I_C$ = 1 Adc, $V_{CE}$ = 10 Vdc, $f_{test}$ = 1 MHz) | $f_T$ | 4 | – | – | MHz |
| Output Capacitance ($V_{CB}$ = 10 Vdc, $I_E$ = 0, $f_{test}$ = 1 MHz) | $C_{ob}$ | – | – | 500 | pF |

**PNP MJW21193**

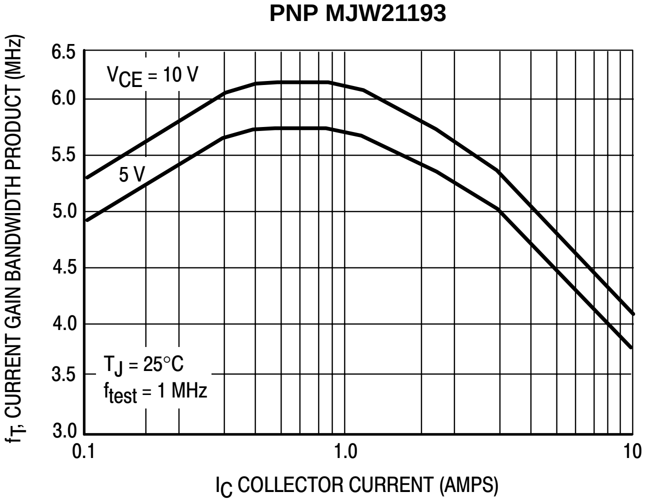



**Figure 1. Typical Current Gain Bandwidth Product**

**NPN MJW21194**

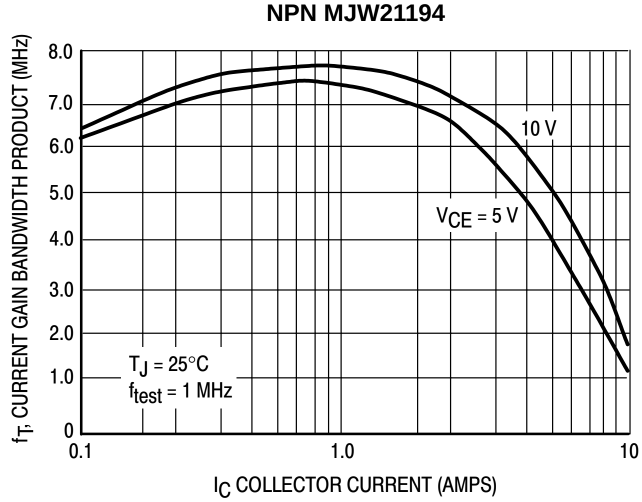



**Figure 2. Typical Current Gain Bandwidth Product**

## TYPICAL CHARACTERISTICS

**PNP MJW21193**

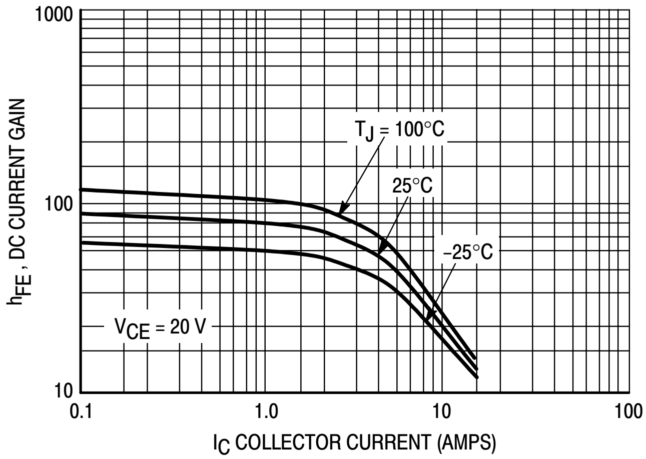



**Figure 3. DC Current Gain, $V_{CE}$ = 20 V**

**NPN MJW21194**

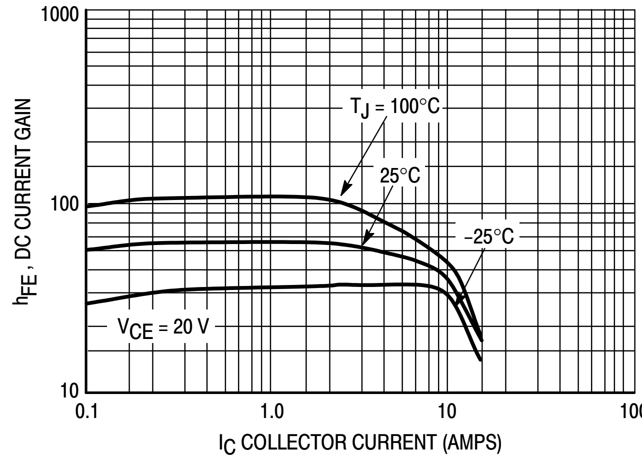



**Figure 4. DC Current Gain, $V_{CE}$ = 20 V**

**PNP MJW21193**

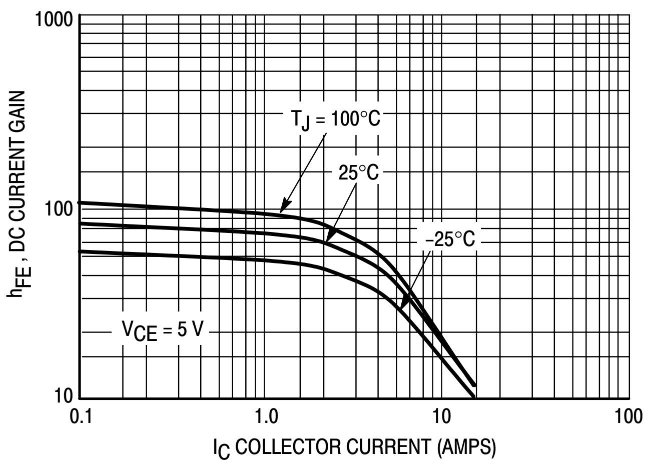



**Figure 5. DC Current Gain, $V_{CE}$ = 5 V**

**NPN MJW21194**

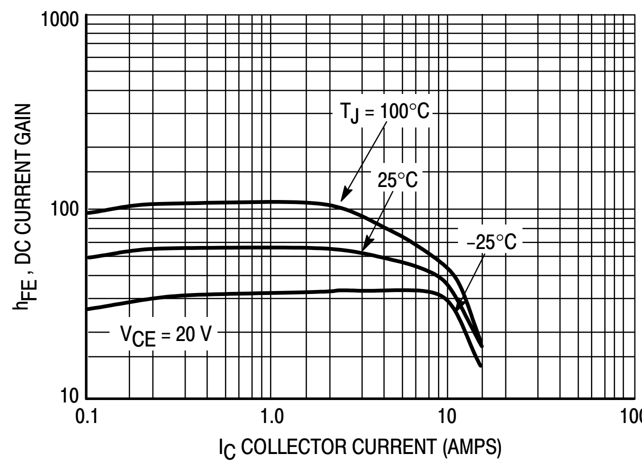



**Figure 6. DC Current Gain, $V_{CE}$ = 5 V**

**PNP MJW21193**

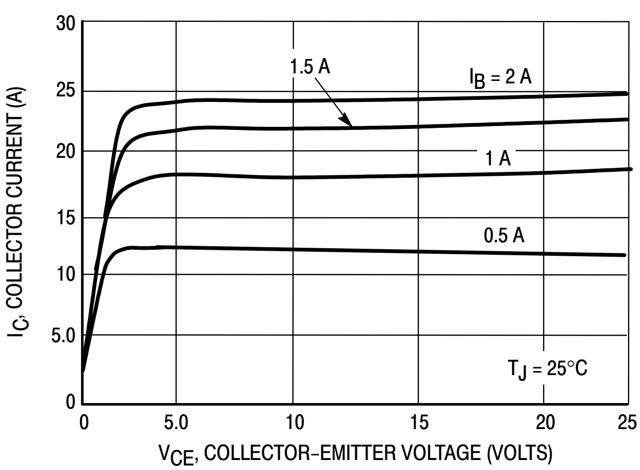



**Figure 7. Typical Output Characteristics**

**NPN MJW21194**

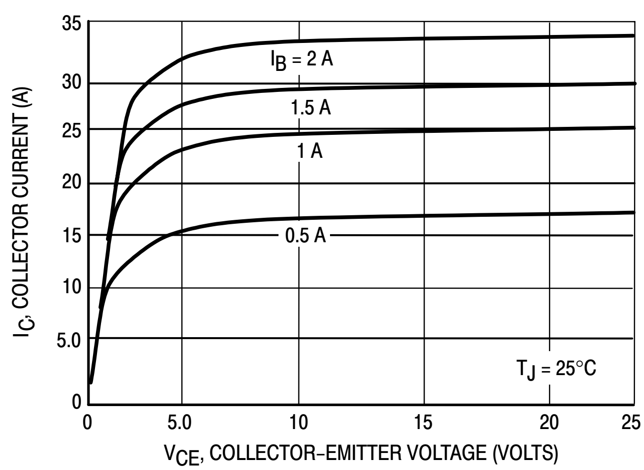



**Figure 8. Typical Output Characteristics**

## TYPICAL CHARACTERISTICS

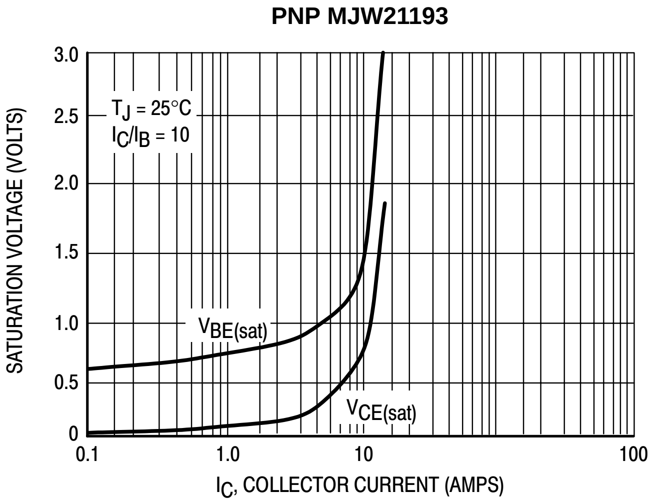



**Figure 9. Typical Saturation Voltages**

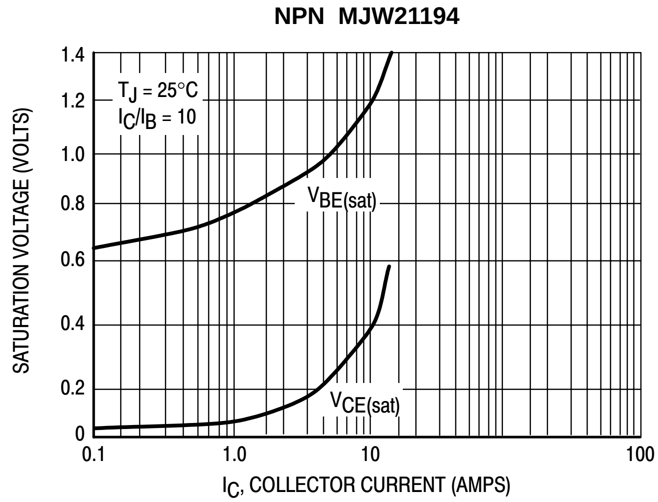



**Figure 10. Typical Saturation Voltages**

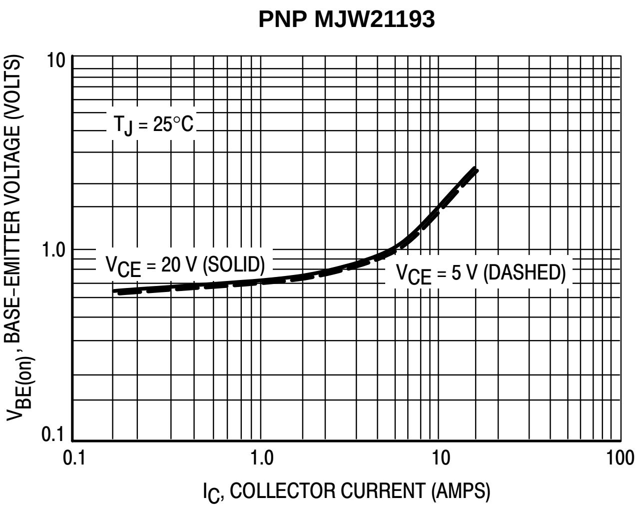



**Figure 11. Typical Base–Emitter Voltage**

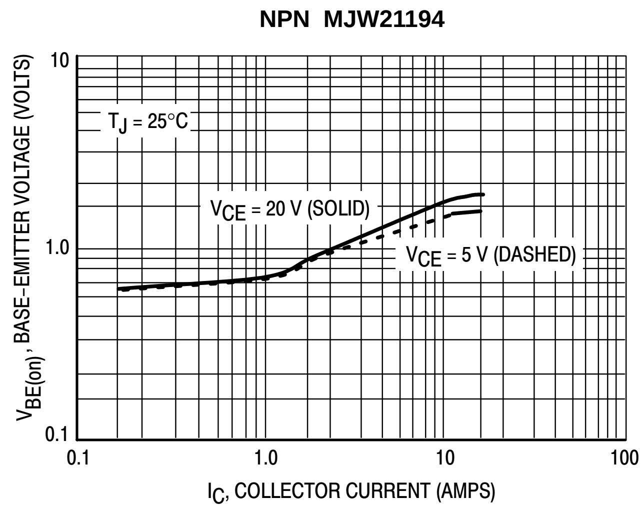



**Figure 12. Typical Base–Emitter Voltage**

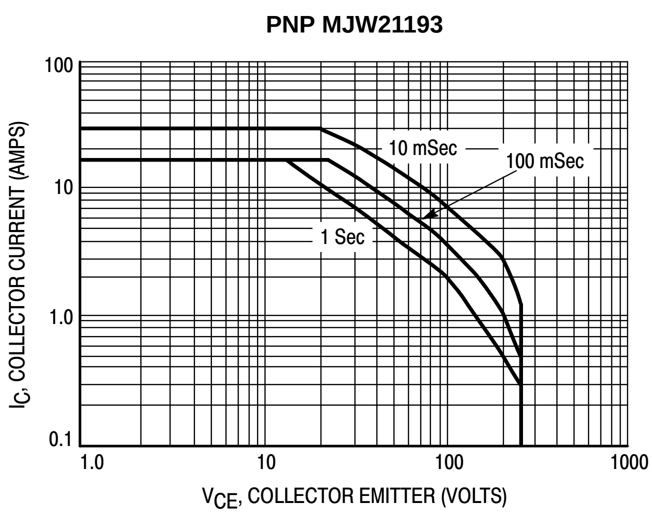



**Figure 13. Active Region Safe Operating Area**

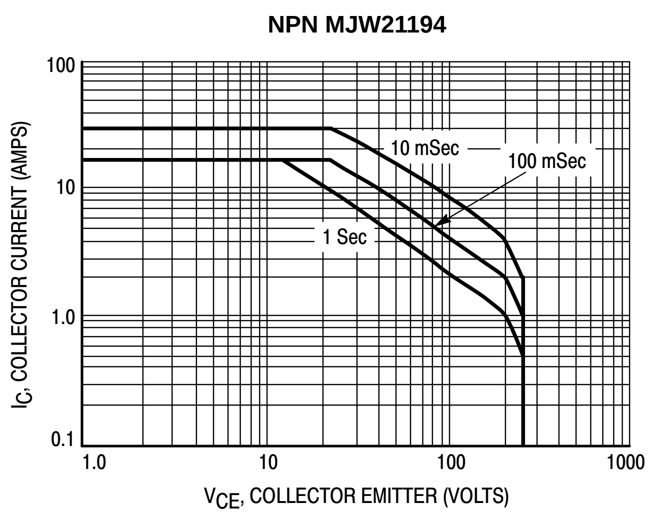



**Figure 14. Active Region Safe Operating Area**

There are two limitations on the power handling ability of a transistor; average junction temperature and secondary breakdown. Safe operating area curves indicate $I_C - V_{CE}$ limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 13 is based on $T_{J(pk)} = 150°C$; $T_C$ is variable depending on conditions. At high case temperatures, thermal limitations will reduce the power than can be handled to values less than the limitations imposed by second breakdown.

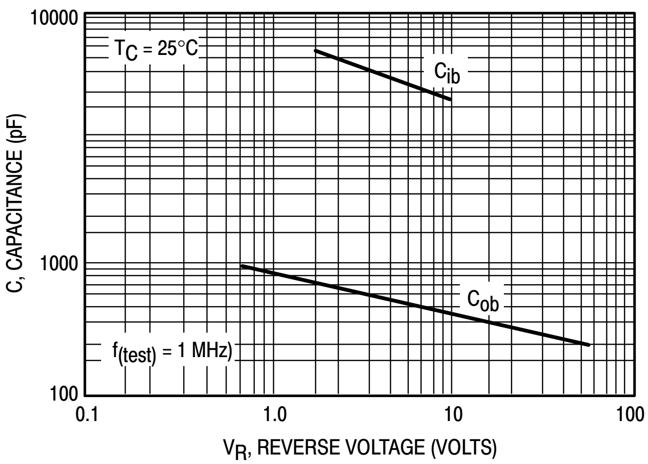



**Figure 15. MJW21193 Typical Capacitance**

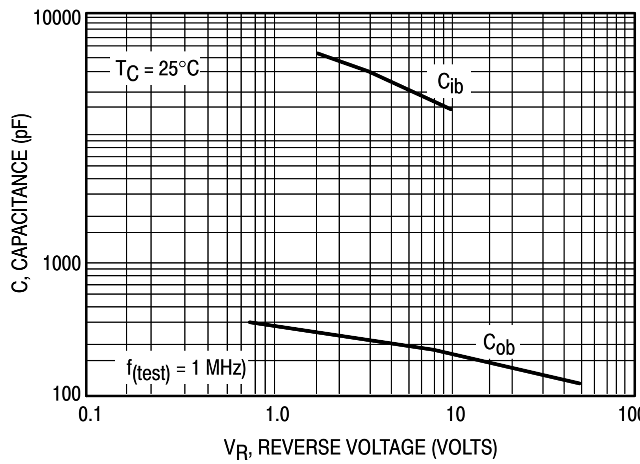



**Figure 16. MJW21194 Typical Capacitance**

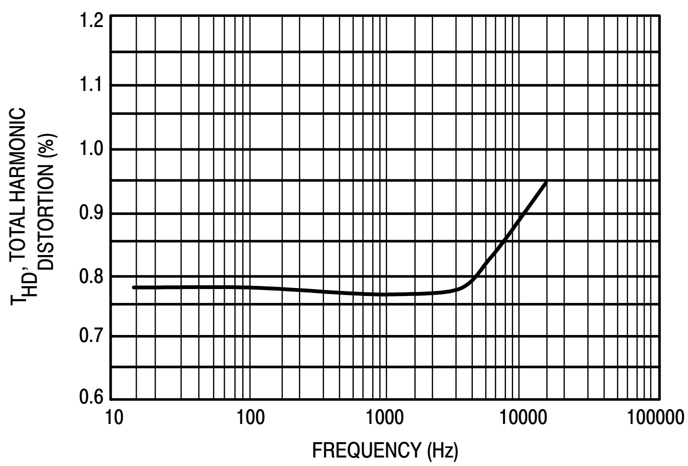



**Figure 17. Typical Total Harmonic Distortion**

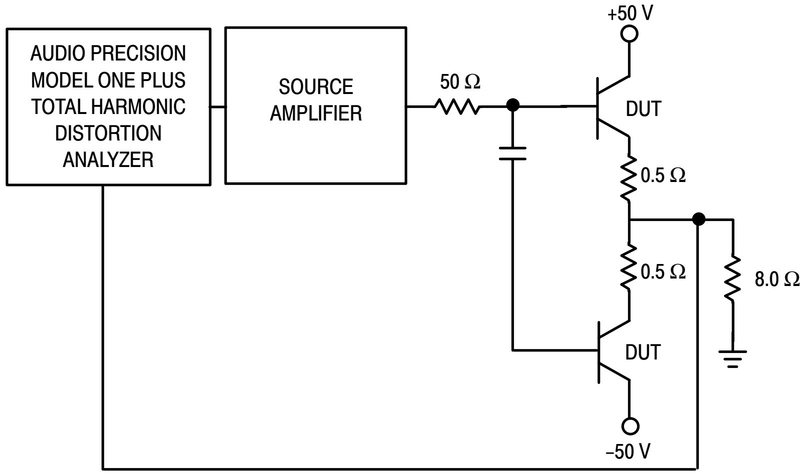
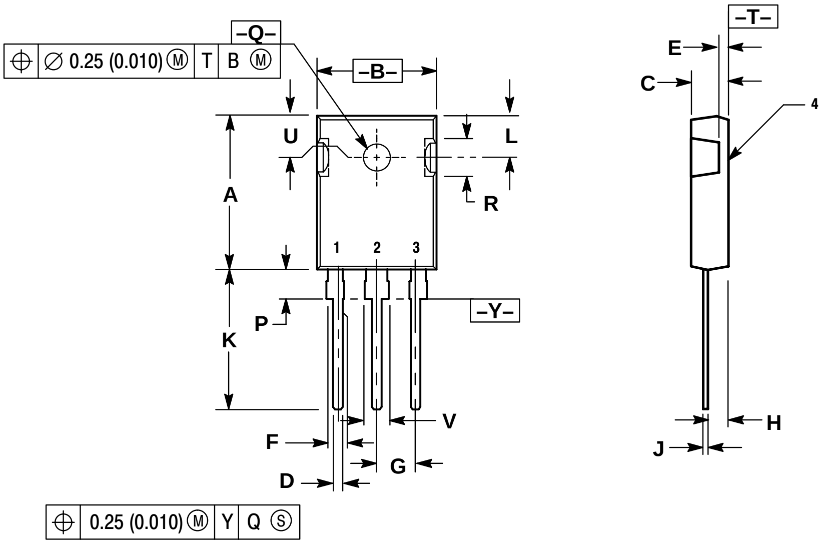



**Figure 18. Total Harmonic Distortion Test Circuit**

## PACKAGE DIMENSIONS

**TO–247**
CASE 340K–01
ISSUE C




NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

| DIM | MILLIMETERS MIN | MILLIMETERS MAX | INCHES MIN | INCHES MAX |
|---|---|---|---|---|
| A | 19.7 | 20.3 | 0.776 | 0.799 |
| B | 15.3 | 15.9 | 0.602 | 0.626 |
| C | 4.7 | 5.3 | 0.185 | 0.209 |
| D | 1.0 | 1.4 | 0.039 | 0.055 |
| E | 1.27 REF | | 0.050 REF | |
| F | 2.0 | 2.4 | 0.079 | 0.094 |
| G | 5.5 BSC | | 0.216 BSC | |
| H | 2.2 | 2.6 | 0.087 | 0.102 |
| J | 0.4 | 0.8 | 0.016 | 0.031 |
| K | 14.2 | 14.8 | 0.559 | 0.583 |
| L | 5.5 NOM | | 0.217 NOM | |
| P | 3.7 | 4.3 | 0.146 | 0.169 |
| Q | 3.55 | 3.65 | 0.140 | 0.144 |
| R | 5.0 NOM | | 0.197 NOM | |
| U | 5.5 BSC | | 0.217 BSC | |
| V | 3.0 | 3.4 | 0.118 | 0.134 |

STYLE 3:
PIN 1. BASE
2. COLLECTOR
3. EMITTER

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